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ABSTRACT

Intended for educators interested in and committed to an information feedback/evaluation system, this 3-part training package contains information pertaining to the Evaluation Service Center for Occupational Education (ESCOE) and what it has to offer by way of behavioral objectives, curriculum improvement, and feedback services. Part 1 contains background information and exercises for learning how to write and use behavioral objectives. Part 2 offers an overview of the services provided by the ESCOE, including examples of objectives received and processed by ESCOE and feedback via computer print-outs to participating local educational agencies. Part 3 contains useful strategies, suggestions, and training techniques intended to help those who are interested in learning how to write and use behavioral objectives in their instruction as well as those who plan to train others in the field. (SB)

ED 060218

BEHAVIORAL OBJECTIVES TRAINING PACKAGE

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BEHAVIORAL OBJECTIVES TRAINING PACKAGE

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION
NOVEMBER 1971

BEHAVIORAL OBJECTIVES
TRAINING PACKAGE

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PREFACE

In recent years Occupational Education has acquired considerable stature. The rise in youth unemployment and underemployment; the shortage of needed personnel in technical, semi-professional and skilled occupations; the re-training and continuing education needs of workers; as well as the rising demand for new educational opportunities, have all served to highlight the need for a re-examination of the field of Occupational Education.

The Evaluation Service Center for Occupational Education is designed as a prototype project with pilot schools participating in the development of a bank of behavioral objectives, defining their stated goals.

The philosophical principle basic to the program evaluation process is that American society and youth are best served if program objectives for occupational education are selected by the Local Educational Agency (LEA) and not prescribed by a central authority. The fundamental purpose, then, of such an information feedback system is to provide a meaningful information base to the teacher and the administrator for the improvement of instruction in occupational education, by supplying the participating schools with a continuous flow of feedback information describing student progress on locally determined objectives.

To develop this source of feedback information, input data is supplied to the Evaluation Service Center in the form of behavioral (meaningful) performance objectives. These objectives are then coded and placed in a computer data bank. When raw (original) objectives are available within a given subject area, they are retrieved from the data bank and synthesized by a panel of instructors active in that particular subject. The objective synthesis process* (which consists of combining raw objectives having the

* Refer to The SYNOB Package, Instruction Manual, Evaluation Service Center, October 1971

same or similar performances into one larger objective so that all variations of conditions and extent indicated by the Local Educational Agency are included) leaves in its format considerable room for variations and subsequent modifications by the LEAs. From these synthesized objectives, criterion tests are constructed which are then made available to the LEAs to be used in any way they deem advisable.

All participating LEAs have access to any and all information in this data bank. Any information that would identify the source of a given objective is blocked out when the printout is sent to any other LEA other than the one that submitted the same. Through this process, particpating LEAs retain their autonomy completely and are not required to test for any objectives that are not part of their stated goals.

The Evaluation Service Center must then be thought of as an information feedback and evaluation system which seeks program improvement and modification rather than program condemnation. It is designed as a partnership endeavor between state agencies and local schools, serving as a feedback and evaluation instrument which provides information on a state-wide basis and yet preserves local autonomy in curriculum design.

This training package then is offered by the members of the staff at ESCOE to those educators interested in, and committed to, the ideals of such an Information Feedback/Evaluation System.

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INTRODUCTION

Broadly speaking, the purpose of this ESCOE publication is three-fold:

1. This Training Package contains the material required to learn how to write and use Behavioral Objectives. It is intended to serve as a User's Guide for those interested in the "WHYs" and "WHEREFORs", and "HOW TOs" of objectives written and implemented in meaningful, directly observable terms.

2. The publication includes an overview of the services provided by the Evaluation Service Center for Occupational Education. Examples of objectives received and processed by the Center, as well as feedback via computer print-outs to participating LEAs are included. This Package is intended to serve as an introduction to the Information Feedback/Evaluation System and thus places behavioral objectives within the context that they will be developed and utilized.

3. The Training Package contains certain useful strategies, suggestions, and training techniques intended to help both those who are interested in learning how to write and use behavioral objectives in their courses of instruction, as well as those who plan to train others in the field.

It is hoped that this Training Package developed by the ESCOE Staff will prove both useful and informative to Instructors and Facilitators associated with ESCOE and other interested educators in providing some clear insights into what ESCOE is and has to offer by way of Behavioral Objectives, Curriculum Improvement, and Feedback Services.

PART I

BEHAVIORAL OBJECTIVES

BACKGROUND

"If we don't know where we are going
How will we know when we have arrived?" (Mager)

The need for Behavioral Objectives arose out of a growing concern among educators to develop less nebulous and more objective approaches to education. The contribution of early pioneers in this field: Robert Mager, W. James Popham, Benjamin Bloom and several others have led to the growing acceptance of behavioral objectives as a powerful instrument in curriculum planning and evaluation activities.

As Anderson (1967) pointed out: "Without well-stated objectives, there is no basis for making any judgment as to whether or not the program has achieved the desired goals". Brothers and Holsclaw (1969) suggest that the use of behavioral objectives has implications for training students in ways of acting and reacting in their particular subject area situations. Mager (1962) went so far as to indicate that an instructor might not have to do much else if he would just provide each learner with a copy of the specific course objectives. Popham (1969) has been instrumental in establishing an Instructional Objective Exchange at the Center for the Study of Evaluation in Los Angeles, California. Plowman (1968) indicates that educational objectives guide what the teacher does and exert great influence upon the students. He states: "The most important thing a teacher can do is to modify behavior in a positive direction. He can do this by defining, teaching to, and evaluating pupil progress and instruction in light of behavioral objectives".

Other writers have admitted there are many benefits to be derived in utilizing behavioral objectives but have stated several reservations. Atkins (1968) felt that it was quite difficult to identify many of our

most important educational objectives; that demands for behavioral specification might hamper certain types of highly desirable innovations; and that behavioral objectives may not relate to the teaching of values since they are not easily measured.

Rath, Ojemann, Kapfer (1968) felt that the degree of specificity required in the writing process might result in some areas in unreal, impratical,or trivial objectives.

In summing up the general literature concerning the development and use of behavioral objectives, it is important to point out that even the critics of certain features of behavioral objectives are also quick to admit some of their advantages. It appears then that behavioral objectives when written at the appropriate level and degree of specificity can be effective when utilized in the classroom to promote increased pupil achievement, for program development, or for curriculum planning activities.

RATIONALE

Any worthwhile study concerned with educational program improvement must include the proper identification and description of specific objectives if the program variables are to be evaluated. Unless the specific objectives unique to each content area or educational project are clearly stated, one student, teacher, or program planner will not be sure as to:

(a) what exactly is to be done

(b) how it is to be done

(c) when the goal has been accomplished

Instructional program development and research usually begins with a specified need or an observable program. These needs may begin with a teacher's observation of some overt behavior displayed by one or more students or from information obtained through various student testing programs. Course content and sequence, along with subject area skill continuums, may also be the basis for determining needs.

In the last analysis, quality education refers to the effectiveness of any educational program in meeting its own specifically defined objectives - and it is from this need that behavioral objectives are identified, and form the basis for the major portion of all evaluation.

SUMMARY A

GENERAL BACKGROUND

The fundamental purpose of an Information/feedback System is to provide a meaningful information base to the teacher and administrator for the improvement of instruction, by supplying each participating school a continuous flow of feedback-information describing student progress on locally determined objectives.

The design of the Evaluation Service Center for Occupational Education emphasizes the development of a comparable, broad based, data pool; a technical support component to process and analyze the data; dissemination of feedback; programmatic research and evaluation of instructional efforts to meet state-wide and local needs. For, in the last analysis, quality education refers to the effectiveness of any educational program in meeting its own specifically designed objectives.

Thus, the need for Behavioral Objectives arose out of a growing concern among educators to develop less nebulous, more effective objective approaches to education. The contributions of early pioneers in the field: Robert Mager, W. J. Popham, Benjamin Bloom and several others have led to the recognition of Instructional Objectives as a powerful instrument in curriculum planning, program development and evaluation activities.

Any worthwhile study concerned with educational program improvement must include the proper identification and description of specific objectives if the program variables are to be evaluated. Unless the specific objectives unique to each content area or educational project are clearly stated, the student, teacher, or program planner will not be sure as to:

(a) what exactly is to be done
(b) how it is to be done
(c) when the goal has been accomplished

"If we don't know where we are going,
How will we know when we have arrived?"
(Mager)

CONTENT

What is a Behavioral Objective?

Behaviorally speaking, the purpose of a Behavioral Objective is to make clear to teachers, students and other interested persons:

1. Exactly what it is that needs to be learned - stated in directly observable, measurable terms.....PERFORMANCE
2. What materials and procedures will work best to teach what needs to be learned.....CONDITIONS
3. In which manner it can be determined that this learning has been achieved.....EXTENT

In a nutshell, a well-written Behavioral Objective should specify under what CONDITIONS and to what EXTENT a certain kind of PERFORMANCE can be expected to take place.

Behavioral Objectives offer a practical approach to the improvement of teaching and learning:

Teachers benefit by having measurable and observable objectives that are useful in prescribing meaningful learning experiences and in evaluating pupil progress.

Students benefit by knowing exactly what is expected of them in acquiring knowledge and skills, through being fully apprised of critera by which their performance will be judged.

In essence, BEHAVIORAL OBJECTIVES are a tool which, when widely used, can facilitate optimum development for the student.

An objective can be defined as an AIM or a DESIRABLE OUTCOME of action. We use it first to direct our effort and then as a yardstick to assess our degree of achievement - how successful we have been in our effort.

In this context, the objective is useful in proportion to:

(1) how specific it is

(2) how well he can see or measure its attainment

A BEHAVIORAL OBJECTIVE MAY BE DEFINED AS..... "A MEASURE FROM WHICH CAPABILITIES CAN BE INFERRED, LISTING THE EXACT PERFORMANCE TO BE DEMONSTRATED, THE EXACT CONDITIONS UNDER WHICH THE PERFORMANCE IS CARRIED OUT, AND THE EXACT EXTENT (degree of completeness, accuracy, speed, etc.) TO WHICH THE PERFORMANCE WILL BE MEASURED."

Exercise 1:

WHAT DO YOU THINK BEHAVIORAL OBJECTIVES ARE?

(You may check more than one answer.)

_____ A. Statements that give the instructor a general outline of the course structure.

_____ B. Statements that tell the instructor exactly what the students are to learn, how well they are to learn, and any necessary conditions under which the learning is to take place.

_____ C. A series of understandings for the students to learn in class.

_____ D. The behaviors the student should acquire during the course of instruction.

SEE NEXT PAGE FOR CORRECT ANSWERS

Answers

A. Behavioral Objectives seek to achieve specificity: exactly what it is that needs to be learned, under what conditions, and to what extent. The exact behaviors should be specified so that all concerned know what the exact instructional intent of an objective is.

B. Correct

C. Understandings are not directly observable, measurable behaviors. It is important to state objectives in performance terms.

D. Correct

HOW TO WRITE BEHAVIORAL OBJECTIVES:

A well-written BEHAVIORAL OBJECTIVE says three things:

PERFORMANCE: What it is that a student who has mastered the performance will do - in directly observable terms; what it is that he will have to do when he is evaluated.

CONDITIONS: Under what conditions the performance will take place - the situation and the materials with which he will have to perform.

EXTENT: The exact criteria used to measure the performance.

A well-written Behavioral Objective says three things:

(1) PERFORMANCE - the kind of behavior that will be accepted as evidence that the learner has achieved the objective

(2) CONDITIONS - the important conditions under which, and the materials which, the behavior will be expected to occur

(3) EXTENT - the criteria of acceptable performance -- which defines how well the learner must perform

Step 1: Write a statement describing one of your educational intents and then modify it until it answers the question: "What is the learner doing when he is demonstrating that he has achieved the objective?"

Step 2: Define the desired behavior further by describing the important condition needed to achieve the above-stated objective.

Step 3: Add to this how well the student is expected to perform.

WHAT MAKES UP A BEHAVIORAL OBJECTIVE?

Some possiblities:

CONDITIONS	PERFORMANCE	EXTENT
Data	Explain	± 1/10"
Tools	Identify	4 out of 5
Equipment	Name	90% within
Picture	Compute	20 minutes
Blueprint	Adjust	± .05"
Machine	Cut	
Stock	Define	Patient is
Lathe	Sew	clean and dry
Fabric	Pronounce	
Patient	Measure	
Model	Grind	

Electronics Technology 160108

CONDITIONS - (Given) schematic diagram, materials, tools and test equipment

PERFORMANCE - (The student will) wire a full wave power supply and observe scope waveforms with and without filtering

EXTENT - 100% accuracy in wiring and 10% tolerance in observing waveforms in 90 minutes

Other Quantity Food 172999

CONDITIONS - (Given) soiled dishes and automatic diswasher with racks

PERFORMANCE - (The student will) pre-rinse, rack, wash and rinse, and dry and stack

EXTENT - 100 dishes in 12 minutes

Upholstering 173500

CONDITIONS - (Given) frame, stripper, sandpaper

PERFORMANCE - (The student will) strip all exposed wood surfaces and sand to natural wood, replacing or repairing broken areas.

EXTENT - To conform to original frame structure.

Structural Grammar 050202

CONDITIONS - (Given) a list of X number of forms combining helping verb and verb, pronoun and verb, and negative adverb.

PERFORMANCE - (The student will)insert the proper contraction form.

EXTENT - To a minimum of 60%.

Practical Nursing 070302

CONDITIONS - (Given) previously occupied gatch bed, a linen bag, the text.

PERFORMANCE - (The student will) strip the bed avoiding the flapping of sheets, blankets and dropping linen on floor; avoid rubbing linen against uniform and hospital equipment.

EXTENT - Five minutes instructor's prescription.

Foods and Nutrition 090107

CONDITIONS - (Given) fresh vegetables, knife and cutting board and container.

PERFORMANCE - (The student will) clean and cut into 1/4 inch pieces and place in container.

EXTENT:- 100%.

Prerequisites	Description	Objectives*
What a learner has to be able to do to qualify for a course	What the course about	What a successful learner is able to do at the end of the course

NOTE: Whereas an objective tells what the learner is able to do as a result of some learning experiences, the course description tells only what the course is about - it does not explain what will be accepted as adequate achievement. An objective (unlike a course description) actually describes the intended outcome of the course.

Exercise 2:

WHAT FORMS A BEHAVIORAL OBJECTIVE?

Identify the three components of a Behavioral Objective thus:

ENGINEERING RELATED TECHNOLOGY

CONDITION Given a line diagram of an optical metallurgical microscope

PERFORMANCE The student will be able to trace the light path from its source by naming the parts through which it must pass

EXTENT At least 4 out of 5 parts

AUTO MECHANICS

CONDITION From memory without reference material

PERFORMANCE List in writing the properties in a coolant

EXTENT 95% accuracy, time 15 minutes

AGRICULTURAL TECHNOLOGY

CONDITION A complex schematic or actual equilibrium diagram and a specific alloy composition

PERFORMANCE Should be able to draw the cooling curve for the given alloy

EXTENT 80% correct

Write a few lines describing each component:

CONDITIONS _____

_____

_____

_____

PERFORMANCE _____

_____

_____

_____

EXTENT _____

_____

_____

_____

_____

List a few examples of each:

CONDITIONS	PERFORMANCE	EXTENT

What goes into a meaningfully stated Behavioral Objective?

A MEANINGFULLY STATED OBJECTIVE IS ONE THAT SUCCEEDS IN COMMUNICATING THE WRITER'S INSTRUCTIONAL INTENT TO THE READER.

How do you write objectives that will describe the desired behavior of the learner?

1. Identify the desired behavior by name -- specify the kind of behavior that will be accepted as evidence that the learner has achieved the objective.
2. Try to define the desired behavior further by describing the important conditions under which the behavior will be expected to occur.
3. Specify the criteria of acceptable performance by describing how well the learner must perform to be considered acceptable.

PERFORMANCE:

The most important characteristic of a useful objective is that it identifies the kind of PERFORMANCE that will be accepted as evidence that the learner has achieved the objective.

A statement of an Objective is useful to the extent that it specifies what the learner must be able to DO or PERFORM when he is demonstrating his mastery of the objective. One can only determine the state of the learner's intellect or skill by observing some aspects of his BEHAVIOR or PERFORMANCE.

("BEHAVIOR" --- OVERT ACTION/OBSERVABLE PERFORMANCE)

The way to write an OBJECTIVE that meets the first requirement is to write a statement describing one of your educational intents and then modify it, until it answers the question:

What is the learner DOING when he is demonstrating that he has achieved the objective? *Refer to Part III Suggested Strategy for Formulating Directly Observable Performance (The Operationalization of Fuzzy Concepts p. 74)

Some Commonly Used Behavioral Verbs

write	read
identify	classify
name	cut
solve	grind
construct	sew
list	adjust
define	compute
demonstrate	pronounce
describe	locate
contrast	assemble
compare	estimate
measure	state

Words Open To Many Interpretations

(To Be Avoided)

know	enjoy
understand	believe
grasp	have faith in
appreciate	be aware of

CONDITIONS

To state an objective that will successfully communicate your educational intent -- you will sometimes have to define performance further by stating conditions you will impose upon the learner when he is demonstrating his mastery of the objective. These might include:

(a) What will the learner be PROVIDED?

(b) What will the learner be DENIED?

(c) What are the CONDITIONS under which you expect the behavior to occur?

(d) Are there are any skills that you are specifically NOT trying to develop? Does the objective exclude such skills?

In other words: With what, or to what, is the learner doing whatever it is that he is doing?

Some Examples: (Conditions)

Given a list of _____

Given a reference _____

Given a blueprint/diagram/chart _____

Given a standard set of tools/equipment _____

Given a properly functioning _____

Given a piece of _____

Without the aid of references.

Without the aid of a slide rule.

Without the aid of tools.

Conditions are in the form of givens or restrictions which are required to measure the stated behavior or performance.

EXTENT

After having described what it is you want the learner to be able to do -- you can increase the ability of an objective to communicate by telling the learner HOW WELL you want him to be able to do it -- by specifying at least the MINIMUM ACCEPTABLE PERFORMANCE. Some ways of indicating CRITERIA OF ACCEPTABLE PERFORMANCE:

(a) Time Unit

(b) Minimum number of correct responses

(c) Minimum acceptable skill

(d) Percentage or proportion

(e) Amount of acceptable deviation from some standard.

SUMMARY B

ON WRITING BEHAVIORAL OBJECTIVES

Behaviorally speaking, the purpose of an Instructional Objective is to make clear to teachers, students and other interested persons:

(1) Exactly what it is that needs to be learned, stated in directly observable measurable terms. PERFORMANCE

(2) What materials and procedures will work best to teach what needs to be learned. CONDITIONS

(3) In which manner it can best be determined that this learning has been achieved. EXTENT

Instructional Objectives offer a practical approach to the improvement of teaching and learning:

Teachers benefit by having measurable and observable objectives that are useful in prescribing meaningful, learning experiences and in evaluating pupil progress.

Students benefit by knowing exactly what is expected of them in acquiring knowledge and skills, through being fully apprised of criteria by which their performance will be judged.

In a nutshell then -- a well-written Instructional Objective should specify under what conditions and to what extent a certain kind of performance can be expected to take place.

SOME EXAMPLES:

Sheet Metal

CONDITIONS: Given sheet of 18 guage metal, power brake, shear, scribe, and scale.

PERFORMANCE: Layout, cut, form ariel assemble box pan of 4 x 4 x 6 inches.

EXTENT: ± 1/8 inch

Cosmetology

CONDITIONS: Manicuring tools and cosmetics, and patron.

PERFORMANCE: Remove polish, file, treat cuticle.

EXTENT: Well-groomed, attractive nails, filed smooth.

Carpentry

CONDITIONS: Lumber, foundation with bolts and blueprint

PERFORMANCE: Lay out 2 x 8 sills, mark for length and anchor bolt locations.

EXTENT: Overall lengths shall be within 1/16 inch, joints shall be square and close and bolt holes bored within 1/16 of marked center.

Exercise 3:

ARE YOU WRITING GOOD BEHAVIORAL OBJECTIVES?

Pause to see if you can check the correct answers.

1. Which of the following words would be used in a good behavioral objective?

_____(a) Grasp

_____(b) Believe

_____(c) List

_____(d) Measure

_____(e) Compute

_____(f) Identify

_____(g) Understand

_____(h) Know

(If you are unsure, turn back to page 13)

2. Which of the following is NOT a Behavioral Objective component?

_____(a) Statement of desired behavior (what the student is expected to do to demonstrate achievement of objective).

_____(b) Delineation of the teacher's role in the learning process.

_____(c) Specification of Conditions under which behavior should be demonstrated.

_____(d) Statement of the criteria for success.

(You may want to check your answers; see page 27.)

3. A good Behavioral Objective:

_____(a) is stated in directly observable performance terms.

_____(b) allows for considerable ambiguity (can be interpreted differently by different people).

_____(c) can be used as a yardstick to assess a student's degree of achievement: how well he has accomplished what he was expected to do.

_____(d) is stated with sufficient specificity and clarity to be useful.

_____(e) is a highly complex development.

_____(f) talks about general goals of learning.

(Answers; p. 27)

4. How could the following statement be converted into behavioral terms?

"Appreciates the value of the scientific method."

_____(a) Knows the scientific method and applies it effectively.

_____(b) Understands the principles of the scientific method.

_____(c) Uses correct experimental procedures in problem solving.

_____(d) Is able to list the basic principles of scientific procedures.

(Answers below)

ANSWERS

1. (c), (d), (e), (f)
2. (b)
3. (a), (c), (d)
4. (d)

PART II

ESCOE AND BEHAVIORAL OBJECTIVES

(How to Fill in Form #12)

ESCOE AND BEHAVIORAL OBJECTIVES

Curriculum revision, new designs in teacher education, and other innovative programs are evidence of the search to improve education. Inherent in these attempts is the assumption that the status of the educational system is known and that its inadequacies can be empirically identified. These attempts to improve instruction and instructional processes, however, have served to spotlight evaluation weaknesses and indicate that most educational improvement programs are carried out on a trial and error basis. Without the ability to compare alternative programs, there exists little basis for directed improvement.

Thus an evaluation process in the educational setting introduces conditions for the adoption of scientific methodology - its main purpose being to feed back information on all relevant aspects of the educational process on a continuous basis. Such an information feedback system would serve as a basis for directed change and provide a climate that facilitates quality control in education.

The design of the Evaluation Service Center of Occupational Education emphasises development of a comparable broadbased data pool of objectives; a technical support component to process and analyze the data, dissemination of feedback; programmatic research and evaluation of instructional efforts to meet state-wide and local needs.

Several unusual logistics problems are generated in the collection and control of state-wide information within a system which seeks to preserve local autonomy in administrative decision-making, in curriculum design and modification, and in school organization. The size of the management and development tasks dictates gradual implementation which includes feasibility studies of the processes, evaluation of the total

system from a smaller experimental system, training of the personnel in the development of objectives, the development of an adequate test battery, the design procedures for data collection, analysis and feedback, dissemination, and the training of personnel to produce the information and to utilize and interpret the results.

The Evaluation Service Center must then be thought of as an information feedback and evaluation system which seeks program improvement and modification rather than program condemnation. It is designed as a partnership endeavor between state agencies and local schools, serving as an evaluation instrument which provides information on a state-wide basis and yet preserving local autonomy in curriculum design.

Thus the program evaluation has been designed to provide feedback on the effectiveness of specific programs in achieving locally determined/selected objectives.

The two essential components of this product assessment are:

1. the development of a file of behavioral objectives for each program
2. the development of a test file for each objective

The continuous feedback of information for the Evaluation Service Center provides a systematic base for analyzing the effectiveness of different instructional strategies, both within and between schools. Generally stated, ESCOE is designed to provide an objective basis for change and improvement in occupational education.

ESCOE is unique from most evaluation programs. Typically, testing programs hold standards constant over schools, i.e. the test represents a standard against which all schools are measured. The Evaluation Service Center, however, holds that such a process is excessively

rigidifying, and not likely to provide a supportive information base for the improvement of education. The Evaluation Service Center seeks to provide a continuous feedback of achievement information in occupational education such that multi-standards can be maintained by LEA's. The task is considerably more difficult than the standardized test approach to program evaluation, but certainly more supportive of sound educational practice.

Obviously, the first step of the evaluation process supported by the Evaluation Service Center is to assist LEAs in stating their own objectives in such a way that they are measurable; by outlining a uniform process of describing multi-standards entertained by participating schools in such a way that comparison and analysis of locally determined program objectives can occur. From these objectives a variety of tests will be developed so that during the following year the LEAs can receive feedback describing student progress on locally determined objectives, with comparison information to other schools offering similar objectives.

The Evaluation Service Center not only provides an information base for program modification which does not in any way standardize programs in occupational education, but it also provides a reasonable basis for educational accountability. There is no question that with increased levels of local, state, and federal support being allocated to occupational education, increased pressure for accountability is being exerted from federal and state levels. It is hoped that the Evaluation Service Center will provide an exemplary model for obtaining and maintaining accountability imformation that in no way threatens the decision making authority or the professional educator on the local level, but at the same time offers a continuous flow of program evaluation information.

The summation of program evaluation information over schools within a state as provided by the Evaluation Service Center offers a very real statement of payoff in occupational education within a state, but not at the cost of program standardization. From an accountability perspective, the program evaluation process supported by the Evaluation Service Center holds that schools are accountable for outcomes on program objectives that their professional faculties determine relevant. Obviously, these objectives are determined within a framework of the existing social-political structure, i.e. local school boards, advisory committees, industrial and manpower information, state regulations, etc.

If the Evaluation Service Center, or more specifically the schools participating in the venture, can demonstrate the feasibility of the process of program evaluation that seeks to treat the simultaneous existence of multi-standards across schools, a very important example will be set that can be generalized to all schools offering occupational education. In a very real sense, the faculties of the participating LEAs as well as the staff of the Evaluation Service Center have an opportunity to offer evidence to the educational community-at-large that education can indeed be managed from an information base and that multi-standards can not only be maintained within local educational agencies, but actually encouraged.

HOW TO FILL IN BEHAVIORAL OBJECTIVE REPORTING FORM # 12

For the purpose of explanation, Form #12 has been divided into different sections. The following pages contain a description of each section and instructions on how to fill in the required information.

Thus:

SECTION 1 (pp. 36-38)	Coding Header
SECTION 2A (p. 39) 2B (pp. 39-54)	Category Breakdown
SECTION 3 (p. 55)	School Year Written
SECTION 4A (p. 56)	State, School
SECTION 4B (p. 56)	Instructor/Facilitator
SECTION 5 (p. 57)	Level
SECTION 6 (p. 58)	No. Taking Objective
SECTION 7 (pp. 59-61)	Text of Behavioral Objective
SECTION 8 (pp. 62-69)	Capability Classification
SECTION 9 (p. 70)	Related Subject Discipline

Form #12 October 1971

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

SECTION 1

Sequence No.	Yr.	T	N	C	St	City-School	Lvl	No.Tk

Cap Cl.	FL	GR	SG	BL	UN	Related Subj. Discipline

Field of Study _____ } SECTION 2 A

Major Group _____ } SECTION 2 A

Subgroup _____ } SECTION 2 A

Block _____ } SECTION 2 B

Unit _____ } SECTION 2 B

School Yr. Written SECTION 3

State _____ } SECTION 4A

School _____ } SECTION 4A

Instructor _____ } SECTION 4B

Facilitator _____ } SECTION 4B

Level SECTION 5

No. Taking Obj. SECTION 6

SECTION 7

Behavioral Objective

Condition(s) _____

Performance _____

Extent _____

SECTION 8

CAPABILITY CLASSIFICATION

Psychomotor

[ ] Psychomotor (Check only if performance requires significant muscular activity)

Cognitive

(Check the one cognitive capability that best describes the mental activity involved)

Knowledge Acquisition

[ ] C1.1 Knowledge of Specifics

[ ] C1.2 Knowledge of Ways and Means of Dealing with Specifics

Knowledge Application

[ ] C2.1 Knowledge Application Without Alteration

[ ] C2.2 Knowledge Application With Alteration

SECTION 9

Related Subject Discipline (Check those applicable)

MATHEMATICS

10 [ ] Basic arithmetic & operations
11 [ ] Informal algebra
12 [ ] Informal geometry
20 [ ] Applied arithmetic
21 [ ] Geometry & measurement
22 [ ] Algebra, graphs, problem solving
30 [ ] Algebra (first year)
31 [ ] Algebra (second year)
32 [ ] Algebra (third year)
33 [ ] Geometry
34 [ ] Trigonometry
35 [ ] Business Arithmetic
36 [ ] Consumer Mathematics
37 [ ] Shop Mathematics
38 [ ] Calculus
39 [ ] Computer Mathematics

OTHER
(Specify)

80 [ ] _____
81 [ ] _____
82 [ ] _____
83 [ ] _____
84 [ ] _____

SCIENCE

40 [ ] General Science

Biology

50 [ ] General Biology
51 [ ] Anatomy
52 [ ] Bacteriology
53 [ ] Biochemistry
54 [ ] Ecology
55 [ ] Nutrition
56 [ ] Physiology

Chemistry

60 [ ] General Chemistry
61 [ ] Inorganic Chemistry
62 [ ] Qualitative Analysis
63 [ ] Quantitative Analysis
64 [ ] Materials Science

Physics

70 [ ] General Physics
71 [ ] Electricity & Magnetism
72 [ ] Electronics
73 [ ] Heat
74 [ ] Mechanics
75 [ ] Nuclear Science
76 [ ] Optics
77 [ ] Solid State Physics
78 [ ] Sound

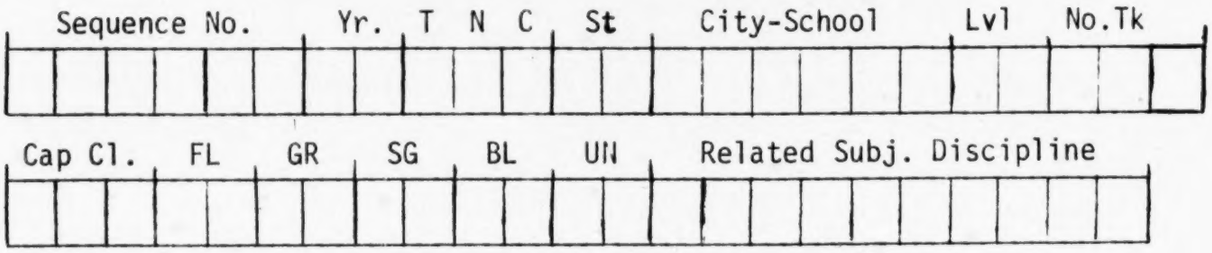
SECTION 1

CODING HEADER

The function of the coding header is to allow the objective to be accessed in computer storage on a number of dimensions as follows: school, level at which offered in the occupational curriculum, subject area, type of capability (cognitive or psychomotor), etc.

Some of the numbering codes (Field of Study, Major Group, Subgroup) follow the system developed by the National Center for Educational Statistics, U.S. Office of Education. The Evaluation Service Center has developed a coding structure for related subject disciplines and capability classification and is in the process of working out a scheme for Block and Unit codes in various sub-groups.

The following is an explanation of the coding header:



Sequence No: The number assigned by the clerical staff at ESCOE to identify each objective, according to when it entered ESCOE. Thus if a particular LEA submit 100 objectives and there are already 8000 objectives in the data bank, these objectives will carry the sequence #008001 - 008100.

Year: The year in which the behavioral objective was written, e.g.: 71, 72, etc.

T.N.C.: Type numbers column, assigned by the key-punching staff to facilitate entry into the computer system.

State: Each state (in which the participating schools are located) was assigned a Code Number:

Thus:

Massachusetts 31

New York 42

City-School: The USOE code number assigned to each LEA:

Thus:

New York City Community College 002696

Diman Regional High School 095605

Level: A two-digit code number: to identify program level and length and the year in which a particular behavioral objective is offered in a program.

No. Taking: The number of students to which this behavioral objective is taught in a school year.

Capability Classification: An in-house coding scheme to identify which item has been checked:

Thus:

[✔] Psychomotor -- [1]

[ ] Psychomotor -- [0]

and [✔] 1.1 Knowledge of Specifics -- [1][1]

etc.

Field, Group, Sub-Group: The USOE codes for different occupational areas.

Thus:

Field of Study: Trade and Industry 17.0000

Major Group: Automotive Industries 17.0300

Sub-Group: Auto Mechanics 17.0302

Block and Unit: (BL, UN) The coding scheme developed by ESCOE to identify the instructional segments within a sub-group.

Thus:

in Auto Mechanics (170302)

Block 01 (Power transmission)

Unit 01 (Engine)

02 (Transmission, Standard)

03 (Transmission, Automatic)

Related Subject Disclipline

A series of code numbers developed by ESCOE to identify the various related subjects checked on the other side of Form #12. (Please note: --the code numbers are printed to the left of each subject, to facilitate the in-house coding process.)

It would be helpful if the field, group, and sub-group Code Numbers as well as the year (e.g., 71, 72, etc.) in which the objective was written -- were entered on the coding headers by those instructors and/or facilitators that submit objectives on Form #12.

CATEGORY BREAKDOWN

SECTION 2A

It was determined at the Amherst Conference (January 1971) that the category breakdown for describing occupational employment areas would be as follows:

Field of Study -- Broadest area of employment as classified by the United States Office of Education Code.

Major Group -- Next largest classification of the USOE Code.

Sub Group -- Occupational groups within a Major Group, (using USOE Classification Code if existent).

SECTION 2B

Because the USOE coding system extends only to the occupational employment areas, it was further agreed that the terminology describing instructional segments would be:

Blocks -- Largest instructional segments of a Sub Group.

Unit -- Instructional segments within a Block.

Behavioral Objectives will be written within a Unit. The number of Behavioral Objectives written to completely describe a Unit may vary, depending on the tasks, skills, or operations necessary for mastery of the Unit. The performance of every task within the Unit must be included within the behavioral objectives at the unit level, so that "no task is untapped".

ILLUSTRATIONS OF FIELD OF STUDY BREAKDOWN

Field of Study -- Trade and Industry

Major Group -- Automotive Industries

Sub Group -- Automotive Mechanics

Block -- Electrical

Unit -- Ignition

Field of Study -- Trade and Industry

Major Group -- Electronics Occupations

Sub Group -- Industrial Electronics

Block -- Active Circuits

Unit -- Amplifiers

Field of Study -- Trade and Industry

Major Group -- Metal Working Occupations

Sub Group -- Machine Shop

Block -- Lathe

Unit -- Straight Turning

Field of Study -- Trade and Industry

Major Group -- Woodworking Occupations

Sub Group -- Millwork and Cabinet-Making

Block -- Machinery

Unit -- Mortiser

Field of Study -- Technical

Major Group -- Engineering Related Technology

Sub Group -- Electronics Technology

Block -- Basic Electricity

Unit -- Direct Current

Field of Study -- Office Occupations

Major Group -- Stenographic, Secretarial and Related

Sub Group -- Secretaries

Block -- Legal Documents

Unit -- Wills

Field of Study -- Health Occupations

Major Group -- Nursing

Sub Group -- Practical Nursing

Block -- Medication

Unit -- Administering Medication

The succeeding section contains a partial listing condensed from Standard Terminology for Curriculum and Instruction in Local and State School Systems (OE 23052). If the Sub Group classifications in this partial list are not complete for your LEA's programs, the reference document introduced above is available through the US Department of Health, Education, and Welfare.

SECTION 2C
OFFICE OF EDUCATION CODES

AGRICULTURE
(01.0000)

01.0100 Agricultural Production
01.0200 Agricultural Supplies
County Agent-Farm Insurance Adjuster
01.0300 Agricultural Mechanics
01.0400 Agricultural Products
01.0500 Ornamental Horticulture
01.0600 Agricultural Resources
01.0700 Forestry
01.9900 Other Agricultural (Specify)
Teacher-Farm Exam Officer

DISTRIBUTION & MARKETING
(04.0000)

04.0000 Marketing (General)
04.0500 Floristry - Horticultural Merchandizing
04.0600 Food Distribution
04.0800 General Merchandize Management (Gen./Mis)
Mid Management
04.2000 Retailing (Gen./Mis.) N.E.C.
Fashion Retailing
04.9900 Other Instructional Programs (Specify)

HEALTH OCCUPATIONS
(07.0000)

07.0100 Dental Services
07.0101 Dental Asst.
07.0103 Dental Lab. Tech.
07.0199 Dental, Other
07.0200 Medical Services
07.0203 Medical Lab. Asst.
07.0299 Medical Services (Other)
07.0300 Nursing
07.0302 Practical (Voc.) Nursing
07.0399 Nursing (Other)

HOME ECONOMICS

09.0100 Homemaking - Preparation for Personal, Home and Family Living
09.0101 Comprehensive Homemaking or Home Economics
09.1002 Child Development
09.0103 Clothing and Textiles
09.0104 Consumer Education
09.0105 Family Health
09.0106 Family Relations
09.0107 Foods and Nutrition
09.0108 Home Management
09.0109 Housing and Home Furnishing
09.0199 Other Homemaking (Specify)

(HOME ECONOMICS) Cont'd.

09.0200 Occupational Preparation
- 09.0201 Care and Guidance of Children
- 09.0202 Clothing Management, Production & Services
- 09.0203 Food Management, Production & Services
- 09.0204 Home Furnishings, Equipment & Services
- 09.0205 Institutional and Home Management & Supporting Services
- 09.0299 Other Occupational Preparation (Specify)

OFFICE OCCUPATIONS (14.0000)

14.0100 Accounting & Computing
14.0200 Business Data Processing Systems
14.0300 Filing, Office Machines, Gen. Office Clerical and Typing
14.0700 Stenographic, Secretarial and Related
14.9900 Other (Specify)

TECHNICAL

16.0100 Engineering Related Tech.
- 16.0102 Agricultural Tech.
- 16.0103 Architectural Tech. (Building Construction)
- 16.0106 Civil Tech.
- 16.0107 Electrical Tech.
- 16.0108 Electronics Tech.
- 16.0109 Electro-Mechanical Tech.
- 16.0111 Industrial Tech.
- 16.0112 Instrumentation Tech.
- 16.0113 Mechanical Tech.
- 16.0114 Metallurgical Tech.
- 16.0117 Scientific Data Processing
- 16.0199 Other Related - Optics Tech., Welding Tech.

TRADES & INDUSTRY (17.0000)

17.0100 Air Conditioning
- 17.0101 Cooling
- 17.0102 Heating
- 17.0103 Ventilating (filtering & humidification)
- 17.0199 Other Air Conditioning

17.0200 Appliance Repair
- 17.0201 Electrical Appliance

17.0300 Automotive Industries
- 17.0301 Body & Fender
- 17.0302 Mechanics
- 17.0399 Other Automotive Industries (Specify)

17.0700 Commercial Art Occ.
- 17.0701 Interior Decorating
- 17.0702 Window Display
- 17.0703 Product Design
- 17.0799 Commercial Art Occ. - Other

17.1000 Construction & Maintenance Trades
- 17.1001 Carpentry
- 17.1002 Electricity
- 17.1005 Painting & Decorating
- 17.1007 Plumbing & Pipefitting
- 17.1099 Construction & Maintenance - Other

17.1300 Drafting Occupation

17.1400 Electrical Occupations
- 17.1401 Industrial Electrician
- 17.1499 Other Electrical Occ.

17.1500 Electronics Occ.
- 17.1501 Communications
- 17.1502 Industrial
- 17.1599 Other Electronics Occ. (Specify)

17.1900 Graphic Arts Occ.
- 17.1901 Composition, Makeup & Typesetting
- 17.1902 Printing Press Occ.
- 17.1903 Lithography, Photography & Platemaking
- 17.1904 Photoengraving
- 17.1905 Silk Screening Making & Printing
- 17.1999 Graphic Arts - Other Offset

17.2300 Metalworking Occ.
- 17.2302 Machine Shop
- 17.2303 Machine Tool Operation
- 17.2305 Sheet Metal
- 17.2306 Welding & Cutting
- 17.2399 Other Metalworking Occ. (Specify)
  - Precision Sheet Metal
  - Metal Fabrication

17.2600 Personal Services
- 17.2602 Cosmetology
- 17.2699 Other Personal Services (Specify)

17.2800 Public Service
- 17.2801 Fireman Training
- 17.2899 Other Public Services (Specify)

17.2900 Quantity Food Occ.
- 17.2901 Baker
- 17.2902 Cook/Chef
- 17.2904 Waiter/Waitress
- 17.2999 Quantity Food Occ. - Other

17.3100 Small Engine Repair (Internal Combustion)

17.3300 Textile Production & Fabrication
- 17.3301 Dressmaking
- 17.3399 Other Textile Production & Fabrication - (Specify)

17.3400 Leatherworking
- 17.3401 Shoe Manufacturing
- 17.3402 Shoe Repair

17.3600 Woodworking Occ.
- 17.3601 Millwork & Cabinet-making
- 17.3699 Other Woodworking Occ. (Specify)
  - Patternmaking
  - House Carpentry

The following section contains a partial listing of Block and Unit Breakdowns in four Subgroups:

(1) Automotive Mechanics

(2) Cabinetmaking and Millwork

(3) Industrial Electronics

(4) Machine Shop

Please note that this is not a finite list of Blocks and Units in these Subgroups and that both categories are open-ended.

The purpose of such a breakdown is primarily to develop a common language to facilitate storage and retrieval from the data bank, so that LEAs may share objectives on various levels.

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Automobile Mechanics 17.0302

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
01	Power Train		
		01	Engine
		02	Transmission, Standard
		03	Transmission, Automatic
		04	Clutch
		05	Rear End
		06	Drive Line
		07	Cooling
02	Fuel & Exhaust		
		01	Carburetor
		02	Fuel Delivery
		03	Exhaust
		04	Exhaust Emission
		05	Pollution Control Valve
03	Electrical		
		01	Ignition
		02	Lighting
		03	Accessory
		04	Charging
		05	Starting
		06	Storage Battery
04	Chassis & Body		
		01	Front Suspension
		02	Rear Suspension
		03	Steering (Power)
		04	Steering (Standard)
		05	Windows and Doors
		06	Accessory
		07	Lubrication
		08	Appearance
		09	Tires
		10	Wheel Bearings (Front)
		11	Wheel Bearings (Rear)
		12	Brakes (Power)
		13	Brakes (Disc)
		14	Brakes (Standard)
05	Basic Equipment & Tools		
		01	Jacking
		02	Grinding and Drilling
		03	Housekeeping
		04	Soldering
		05	Torch Work
06	Record Keeping		
		01	Billing
		02	Repair Orders
		03	Use of Manuals

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Cabinetmaking and Millwork 17.3601

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
01	Bench Work		
		01	Maintenance
		02	Layout
		03	Sanding
		04	Glueing
		05	Assembling
		06	Forming
		07	Finishing
		08	Cutting
		09	Fitting
		10	Lamination
02	Hand Tools		
		01	Measuring Tools
		02	Layout Tools
		03	Testing Tools
		04	Rafter & Framing Square
		05	Sawing Tools
		06	Clamps
		07	Edge Cutting Tools
		08	Boring Tools
		09	Fastening Tools
		10	Smoothing Tools
		11	Lathe Tools
		12	Planes
03	Power Hand Tools		
		01	Circular Saw
		02	Reciprocating Saw
		03	Drill
		04	Plane
		05	Router
		06	Floor Sanders
		07	Belt Sanders
		08	Nailing Machines
		09	Disc Sanders
		10	Finishing Sanders
04	Machinery		
		01	Jointer
		02	Circular Saw
		03	Thickness Planer
		04	Radial Arm Saw
		05	Scroll Saw
		06	Band Saw
		07	Belt Sanders
		08	Spindle Sander
		09	Disc Sander
		10	Shaper

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Cabinetmaking and Millwork (con't)

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
04	Machinery (con't)		
		11	Mortiser
		12	Coper-Tenoner
		13	Grinder
		14	Drill Press
		15	Lathe
		16	Router
		17	Drum Sanders
		18	Multi-operations
		19	Boring Machines
05	Related Science		
		01	Safety
		02	Hand Tools
		03	Power Tools (Hand)
		04	Machinery
		05	Materials
		06	Fasteners
		07	Hardware
		08	Woods
		09	Orientation
		10	Construction Procedures
06	Related Mathematics		
		01	Square Measure
		02	Board Measure
		03	Cubic Measure
		04	Plane Geometry
		05	Percentage
		06	Costs
07	Related Drawing		
		01	Orthographic Projection
		02	Pictorial Drawing
		03	House Plans
		04	Blue Print Reading
08	Projects		
		01	Door
		02	Cabinet
		03	Table
		04	Mantel
		05	Mill Stock
		06	Plastic Laminate
		07	Template
		08	Cleanup & Safety
		09	Stocklist

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Electronics 17.1502

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
01	Passive Circuits - DC		
		01	Introduction to Electricity
		02	Atomic Structure
		03	Static Electricity
		04	Electrical Terms & Units
		05	Batteries & Cells
		06	Series Circuits
		07	Parallel Circuits
		08	Complex Network Circuits
		09	Ohm's Law
		10	Kirchoff's Laws
		11	Power
		12	Overload Protection
		13	Conductance
		14	Magnetism
		15	Electromagnetism
		16	Inductance
		17	Capacitance
		18	DC Motors
		19	DC Generators
		20	Basic Meter Circuits
		21	Test Equipment
02	Passive Circuits - AC		
		01	AC Current & Voltage
		02	AC Generators
		03	AC Motors
		04	Phase
		05	Reactance
		06	Impedance
		07	AC Power
		08	Transformers
		09	Series AC Analysis
		10	Parallel AC Analysis
		11	Complex AC Analysis
		12	Resonance
		13	Band Pass & Band Reject Filters
		14	Time Constants
		15	Test Equipment
03	Active Circuits		
		01	Active Devices
		02	Amplifiers
		03	Oscillators
		04	Detectors
		05	Power Supplies
		06	Pulse Circuits
		07	Integrated Circuits
		08	Transducers
		09	Test Equipment

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Electronics (con't)

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
04	Electronic Systems		
		01	Receivers
		02	Transmitters
		03	Phonographs
		04	Tape Recorders
		05	Television
		06	Wave Propagation
		07	Microwaves
		08	Induction Heating
		09	Ultrasonics
		10	Computer Technology
		11	Control Circuits
		12	Antenna System
		13	Radar
		14	Sonar
		15	Radio Direction Finder
		16	LORAN
		17	Test Equipment
		18	Modulation
		19	Communication System
05	Shop Practices		
		01	Soldering
		02	Tools
		03	Machines
		04	Printed Circuits
		05	Wiring
		06	Cabling
		07	Electronic Equipment Fabrication
		08	Splicing
		09	Departmental Operation
		10	Chassis
		11	Preventive Maintenance
		12	Basic Troubleshooting Techniques
		13	Electronic Drafting

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Machine Shop 17.2302

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
01	Lathe		
		01	Turning(Straight)
		02	Facing
		03	Filing
		04	Polishing
		05	Center Drilling
		06	Drilling
		07	Reaming
		08	Turning (Shoulder)
		09	Knurling
		10	Necking
		11	Recessing
		12	Boring
		13	Chamfer
		14	Cut-off
		15	Collets
		16	Universal Chuck
		17	Independent Chuck
		18	Steady Rest
		19	Follower Rest
		20	Face Plate
		21	Form
		22	Turning (Taper)
		23	Threading (External)
		24	Threading (Internal)
		25	Tool Post Grinder
		26	Technology
02	Milling Machine		
		01	Boring
		02	Drilling
		03	Reaming
		04	Tapping
		05	Milling, Plain
		06	Milling, Straddle
		07	Milling, Slot
		08	Milling, Face
		09	Milling, Form
		10	Indexing, Rapid
		11	Indexing, Simple
		12	Indexing, Differential
		13	Rotary Table
		14	Set-up, Indicate
		15	Set-up, Edge Finder
		16	Set-up, Angular
		17	Technology

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Machine Shop (con't)

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
03	Drill Press		
		01	Center Drill
		02	Counterbore
		03	Countersink
		04	Drill
		05	Polish
		06	Ream
		07	Tap
		08	Technology
04	Power Saw		
		01	Sawing
		02	Blade Technology
05	Shaper/Planer		
		01	Shaping
		02	Technology
06	Numerical Control		
		01	Programming
		02	Tape Preparation
		03	NC Machine Operation
07	Bench Work		
		01	Dowel
		02	Drill, Portable
		03	Easy-out
		04	File
		05	Hacksaw
		06	Hole Transfer
		07	Lapping
		08	Peen
		09	Scribe
		10	Simple Assembly
		11	Simple Layout
		12	Stamping
		13	Threading
		14	Ream
		15	Chisel
		16	Fasteners
		17	Scraping
		18	Hand Tools
		19	Polishing
		20	Technology

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Machine Shop (con't)

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
08	Measuring/ Inspection		
		01	Measuring Tools
		02	Inspection Tools
09	Heat Treatment		
		01	Anneal
		02	Deep Hardening
		03	Case Hardening
		04	Technology
10	Specialization		
		01	EDM
		02	Di-arco Bender
		03	Hone
		04	Jig Borer
		05	Maintenance
		06	Punch Press
		07	Tru-Trace Miller
		08	Turret Lathe
		09	Welding
		10	Tool Crib
		11	Belt Sander
		12	Tru-Trace Drill Press
		13	Tru-Trace Lathe
		14	Radial Drill
11	Grinding		
		01	Cylindrical
		02	Tool and Cutter
		03	Surface
		04	Pedestal
		05	Technology

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Block and Unit Breakdown

Machine Shop (con't)

1 September 1971
Supercedes all
previous editions

Code	Block	Code	Unit
12	Shop Math		
		01	Common Fractions
		02	Decimal Fractions
		03	Square Root
		04	Algebra
		05	Logarithms
		06	Geometry
		07	Trigonometry
13	Blue Print Reading		
		01	One View Drawing
		02	Two View Drawing
		03	Three View Drawing
		04	Auxiliary Drawing
		05	Section Drawing
		06	Assembly Drawing
		07	Isometric Drawing
14	Technical Drawing		
		01	One View Drawing
		02	Two View Drawing
		03	Three View Drawing
		04	Auxiliary Drawing
		05	Section Drawing
		06	Assembly Drawing
		07	Isometric Drawing

SECTION 3

School Year Written

Enter here the year in which the Behavioral Objective was written. This information is requested to identify the year the Objective was entered into the data bank; this is based on the assumption that such imformation is necessary for future out-put concerning popularity and longevity.

SECTION 4

STATE, SCHOOL, INSTRUCTOR, FACILITATOR

A. State

Enter the name of the state in which the participating school is located.

School

Enter the name of the participating school or LEA.

B. Instructor

The name of the person who has written the Behavioral Objective is requested to enable the Evaluation Service Center and facilitator to contact that person if questions arise concerning a particular Behavioral Objective. This information will only be available as the objective is being edited and will never enter the actual data system.

Facilitator

Enter here the name of the person responsible for submitting the Behavioral Objective to the Evaluation Service Center. Again, this information is only necessary to enable the Center to contact the facilitator and instructor during the editing process.

SECTION 5

LEVEL

This is to provide information pertaining to the type of program the school provides and level of the program at which the behavioral objective is offered. The first digit represents the program level and length, and the second digit represents the year in which the behavioral objective is offered in the program. The following is the numerical sequences assigned to the various types of programs:

Program Level	Year Offered	Type of Program Represented
0	0	Pre-Vocational, including exploratory
1	1	Secondary School, 1 year program
2	1	Secondary School, 1st year of a 2 year program
2	2	Secondary School, 2nd year of a 2 year program
3	1	Secondary School, 1st year of a 3 year program
3	2	Secondary School, 2nd year of a 3 year program
3	3	Secondary School, 3rd year of a 3 year program
4	1	Secondary School, 1st year of a 4 year program
4	2	Secondary School, 2nd year of a 4 year program
4	3	Secondary School, 3rd year of a 4 year program
4	4	Secondary School, 4th year of a 4 year program
5	1	Pre-postsecondary program
6	1	Postsecondary School, 1st year of a 1 year program
7	1	Postsecondary School, 1st year of a 2 year program
7	2	Postsecondary School, 2nd year of a 2 year program
8	1	Other

SECTION 6

Number Taking Objective

This is a prediction based on the best evidence available as to how many students will accomplish this objective within the next school year. For instance, if you anticipate that 25 students will enroll in a course that includes this objective, and that the course will be taught twice within the next school year, you would indicate 50 as the Number Taking Objective .

SECTION 7

THE TEXT OF THE BEHAVIORAL OBJECTIVE

Condition(s)...a description of the conditions required for measuring student performance, including any aids to that performance to be allowed the student, or any restrictions or limitations under which the learner must perform.

Performance....a statement of instructional intent, what it is that the learner is expected to do (stated in directly observable, measurable terms) -- the kind of behavior that will be accepted as evidence that the learner has achieved the objective.

Extent.....the criteria of acceptable performance -- how well the learner must perform to be considered acceptable.

Some Examples:

Other Metal Work: (172399)

Condition(s)...(Given) Arc welding machine, welding shield, gloves, welding rod and two steel plates.

Performance....(The student will) weld two steel plates flat together in a tee position.

Extent.....to within 60% of certificate quality.

Electrical Appliances: (170201)

Condition(s)...(Given) a General Electric, Norge or Whirlpool washing machine and proper tools.

Performance....(The student will) move all parts and gears in their proper sequence of operation in the transmission and explain the function of transmission in General Electric, Norge, and Whirlpool washing machines.

Extent.....100% accuracy.

Scientific Data Processing: (160117)

Condition(s)...The 085 Collator and the student subject card file and y+d attendance card file.

Performance....--prepare a control panel to merge each student subject card in front of his attendance card, columns 1-5 in both files contain the Student I.D. Control Numbers.

Extent.....--cards must remain in Student I.D. sequence. Time 2 hours.

General Merchandise Management: (040800)

Condition(s)...Given a careful study of the characteristics and uses of the major textile fibers and fabrics including cotton, linen, wool, silk, rayon, acetate, new synthetics as well as the processes of weaving, dying, printing, and finishing of fabrics.

Performance....Identify, buy and/or sell fabrics and fabric wearing apparel.

Extent.....with expert performance, to instructor's discretion.

SECTION 8

Capability Classification

The performance of a behavioral objective infers or denotes certain abilities. Broadly speaking, these abilities can be classified as:

(1) Psychomotor

(2) Cognitive

(3) Affective

_____ or combinations thereof.

(1) Psychomotor Capabilities:

The ability to do things that are mostly muscular in nature, but which ensue from cognitive capabilities. In general, psychomotor capabilities involve manipulating objects with various parts of the body.

(2) Cognitive Capabilities:

The ability to do things that are mostly intellectual or mental in nature. In general, cognitive capabilities involve acquiring and applying knowledge or information.

(3) Affective Capabilities:

The ability to do things that are mostly emotional in nature. In general, affective capabilities involve acquiring a positive or negative feeling toward a particular object, person, or idea.

The fundamental purpose of the Capability Classification System is to provide an analytical tool to render the produce of the Evaluation Service Center more useful for the purpose of program modification in

a manner consistent with the philosophical principle on which the Center was established. Without such a classification system, the program modification potential offered by the Center would be extremely gross. The Capability Classification System allows institutions to deal with specific elements of programs and provides feedback on the specific capabilities these elements are designed to develop. The usefulness of the Capability Classification System will become evident when schools begin to analyze their programs in comparison with other schools offering similar objectives.

Psychomotor Capabilities

No attempt is made to distinguish among the relative complexity of psychomotor capabilities in the Capability Classification System. Psychomotor capabilities are either simple or complex and the simplicity or complexity of the psychomotor capability is obvious from the description of the capability. For example, hammering a nail into a wall is a relatively simple psychomotor act, while swimming the English Channel on one's back and juggling a mermaid, a monkey, and a martini is complex.

NOTE: Check the Psychomotor box only if the performance of the Objective has significant muscular activity. Pencil and paper activities are generally not psychomotor (calculate, identify, list, describe, etc.)

Cognitive Capabilities

Two major categories of cognitive capabilities are specified: (1) Knowledge Acquisition; (2) Knowledge Application; with two cognitive capabilities stipulated within each major category.

KNOWLEDGE ACQUISITION

Knowledge acquired is knowledge stored or filed, such that it can be recalled at the discretion of the individual. The cognitive capability is the ability to maintain and recall knowledge. Since stored knowledge cannot be observed it must be inferred from recalling or remembering behavior. Further, if knowledge cannot be recalled it is not possible to measure its existence. Therefore, knowledge is defined as that information which can be recalled, while the cognitive capability remains the maintenance and recall of knowledge. Behavioral objectives from which knowledge can be inferred describe the process of knowledge recall. Two kinds of knowledge are defined:

C1.1 Knowledge of Specifics: This includes facts and specific information. For example, names, dates, places, events, technical and trade terminology, etc. The capability might be knowledge of (i.e., to have on file and be able to recall) the parts of an automobile carburetor. A behavioral objective would describe a recall process from which the capability would be inferred. The recall process might be to name, to identify, to list, to select, or to point to all the parts of an automobile carburetor.

C1.2 Knowledge of Ways and Means of Dealing with Specifics: Knowledge within this category is more abstract than knowledge of specific facts. Knowledge within this category would include classification systems, criteria by which specific facts and information are tested,

methods of inquiry for obtaining knowledge or information, and principles and theories by which information is organized on the very highest level. This category does not include capabilities to apply or use ways and means of dealing with specific knowledge, but is limited to knowledge of ways and means of dealing with specific knowledge, i.e. to have on file and be able to recall ways and means of dealing with specific knowledge. Behavioral objectives would describe the recall process from which the knowledge capability could be inferred. Examples of behavioral objectives in this category would be:

(1) The student will name the botanical and zoological classification system in descending order.

(2) The student will list steps in detecting the amount of antifreeze in an automobile radiator.

(3) The student will list the steps by which social scientists develop knowledge.

(4) The student will name the principles of chemistry which are relevant to the life process.

(5) The student will identify a specific and complex description of the theory of evolution.

KNOWLEDGE APPLICATION (PROBLEM-SOLVING)

Knowledge is applied or used to solve problems or reach goals. Cognitive capabilities in this category refer to the ability to use or apply knowledge in problem-solving or goal attainment in a pur-

poseful way. Since one cannot directly observe this capability, one must infer its existence from a behavior. Behavioral objectives in this category, therefore, specify the kinds of behavior from which this inference can be made. Although the behavior has varying degrees of muscular activity, its function is to describe a cognitive capability, i.e. the ability to apply knowledge to solve problems or attain goals.

Two distinct kinds of knowledge application are stipulated: Knowledge Application Without Alteration and Knowledge Application With Alteration.

C2.1 Knowledge Application Without Alteration - Knowledge Application Without Alteration describes an ability to use or apply knowledge in a straightforward way to any situation. What is intended in this category is a cybernetic process, i.e. when presented with a problem or goal, the problem-solving response is to sort through knowledge, recognize the correct knowledge to apply, call up and apply the knowledge and thereby solve the problem or reach the goal. The knowledge is unaltered when applied. This capability could involve the application of little or much knowledge. The chief characteristic of this category is Knowledge Application Without Alteration. Knowledge application in this category usually involves a sequential, checklist process, i.e. if this condition exists, then that solution applies, with that solution already existing as stored knowledge.

Examples of objectives in this category might be: for a computer programmer to apply a known routine to solve a particular data processing problem; for an accountant to apply learned depreciation methods or cost analysis formulas to analyze an institution's fiscal position; or for a researcher to apply a stored statistical formula to test a hypothesis. Unaltered, applied knowledge can be from memory, non-memory or a combination of both. Non-memory knowledge is information called up from such sources as texts, manuals, tables, etc.

A problem solving situation within this category would be something like the following:

1. The problem is recognized.
2. A search of memory and/or non-memory knowledge is made.
3. Memorized and/or non-memorized knowledge will solve the problem.
4. Memorized and/or non-memorized knowledge is <u>applied</u> to solve the problem.

C2.2 <u>Knowledge Application With Alteration</u> - The chief characteristic of this cognitive capability is the need to <u>alter</u> existing knowledge in order to solve a problem. This problem solving cognitive capability includes both alteration and application, whereas Knowledge Application <u>Without</u> Alteration describes a cognitive capability in which knowledge is applied without being altered, i.e. in a straightforward way. Perhaps the best way to specify this cognitive category is to outline the problem-solving process which typifies this cognitive capability:

1. The problem is recognized.
2. A search of knowledge is made.
3. Knowledge does not offer solution.
4. Knowledge is altered.
5. Altered knowledge is applied to solve the problem.

Two methods of knowledge alteration are stipulated:

Analysis - Analysis involves breaking stored knowledge into its constituent parts such that detection of the relationships between the parts can be recognized. This could involve analyzing elements within existing knowledge, analyzing the organizing principles of existing knowledge.

Synthesis - Synthesis involves assembling isolated and specific pieces of knowledge to form a new whole. This is a combining process, which could involve considerable creativity. Synthesis of existing knowledge results in new knowledge, new plans or new understandings of relationships between elements.

Behavioral objectives from which the capability of Knowledge Application With Alteration is inferred describes something of a hypothesis testing behavior in which existing knowledge is analyzed and synthesized such that new knowledge is produced to solve a problem or attain a goal. A very different modus operandi is involved in Knowledge Application With Alteration than with Knowledge Application Without Alteration. In Knowledge Application Without Alteration, the capability involves only search and application, while in Knowledge Application With Alteration the capability involves search,

alteration and application. A well known example of this capability is: Given a certain mathematical principle, a student will demonstrate that the following statement, in which a and b are rational numbers, is true:

$$(a+b)2 = a.2+b.2$$*

If the student had previously stored the step by step information of solving the problem, this objective would infer the cognitive capability of Knowledge Application Without Alteration. If, on the other hand, the student had to alter existing knowledge to arrive at the solution, then the objective would be properly classified in the category of Knowledge Application With Alteration.

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*Gagne, R. W., The Conditions of Learning. New York: Holt, Rinehart & Winston, 1965.

SECTION 9

RELATED SUBJECT DISCIPLINE

It is suggested that it can be of enormous usefulness to participating LEAs to be able to determine the similarity of related subject disciplines among occupational education programs. For example, if objectives are coded by Natural Science discipline, it is possible to determine the common mathematics capabilities sought by all occupational programs within or across institutions. This can be of immediate usefulness to curriculum planners.

The classifications for the Natural Science disciplines are those established by the National Center for Educational Statistics, U.S. Office of Education.*

A checklist of related disciplines is provided on the reverse side of the Behavioral Objective Reporting Form No. 12 and should be completed as part of the objective reporting process. Actual code numbers will be entered by the Evaluation Service Center as a function of the editing process.

*Standard Terminology for Instruction in Local and State School Systems, State Educational Records and Reports Series: Handbook VI, U.S. Department of Health, Education, and Welfare, Office of Education.

Form #12 October 1971

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

Sequence No.						Yr.		T	N	C	St		City-School						Lvl		No.Tk	
0	0	3	2	9	3	7	1				4	2	0	0	2	8	6	8	7	1	6	5

Cap	Cl.	FL		GR		SG		BL		UN		Related Subj. Discipline										
1	2	1	1	7	1	3	0	0														

Field of Study Trade and Industry State New York

Major Group Drafting Occupations School "East Valley Community College"

Subgroup Drafting Instructor "Mrs. XYZ"

Block Drafting Facilitator "Bell Harvey"

Unit Welding Level 7-1

School Yr. Written 1971 No. Taking Obj. 65

Behavioral Objective

Condition(s) Pictorial assembly of 3 standard stock pieces 1-round, 1-square 1-plate with the front view indicated. Assemble pt. 1 to pt. 2 with a fillet weld, pt. 3 to pt. 2 with bevel weld.

Performance An orthographic drawing consisting of top and front views of the assembly using welding as method of assembly with welding symbol showing clearly weld location size, type and any special notes required.

Extent As per proper drafting standards (time limit - 2 hrs.)

Form #12

October 1971

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

Sequence No.						Yr.		T	N	C	St		City-School						Lvl		No.Tk	
0	0	2	4	6	8	7	2				4	2	9	9	9	9	9	9	4	2	1	5

Cap	Cl.		FL		GR		SG		BL		UN		Related Subj. Discipline									
1	2	2	1	7	3	6	0	1	0	4	1	0										

Field of Study: Trade and Industry

State: New York

Major Group: Woodworking Occ.

School: "Green Valley Tech."

Subgroup: Millwork and Cabinetmaking

Instructor: "Bob Franklin"

Block: Machinery

Facilitator: "Betty Jones"

Unit: Shaper

Level: 42

School Yr. Written: 1972

No. Taking Obj.: 15

Behavioral Objective

Condition(s): Given birch stair treads, shaper, noseing, knives and shaper fence for 1/16 removal cut

Performance: Set up and nose birch stair treads

Extent: Knife extension 1/8" beyond collar ± 1/32", fence set exact

Form #12

October 1971

EVALUATION SERVICE CENTER FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

Sequence No.								Yr.	T	N	C	St		City-School						Lvl		No.Tk	
0	0	4	4	0	7	7	1					3	1	9	9	9	9	9	9	7	1	2	5

Cap Cl.		FL		GR		SG		BL		UN		Related Subj. Discipline									
0	2	2	1	7	1	5	0	2	0	2	1	2									

Field of Study Trade and Industry

State Massachusetts

Major Group Electronics Occ.

School "Happy Valley Tech."

Subgroup Industrial Electronics

Instructor "John Doe"

Block Passive Circuits A.C.

Facilitator "Mary Smith"

Unit Resonance

Level 71

School Yr. Written 1971

No. Taking Obj. 25

Behavioral Objective

Condition(s) Given Series RLC circuit, signal generator, and oscilloscope

Performance The student will measure the resonant frequency of the circuit

Extent To ± 10%

PART III

TRAINING STRATEGIES AND MATERIALS

A SUGGESTED STRATEGY FOR FORMULATING

DIRECTLY OBSERVABLE PERFORMANCES

("The Operationalization of Fuzzy Concepts")

(from the paper by Tom Hutchinson)

> *Evaluators, educators, all human beings have enormous difficulties in reporting the sum and sweep of their objectives. We all have goals and we can consciously or unconsciously give priority to some goals over others. But we have few reliable ways to report them to others, or even to reveal them to ourselves (Stake and Denny, 1969, pp. 375-6).*

The problem then is not so much that we operate without goals, but that it is not easy to translate these goals into verbalized, explicit statements of what such goals mean not only to others but to ourselves.

Goals such as "The student will acquire understanding of ...." "The student will be self-actualizing," while legitimate, are difficult to communicate and understand.

After all these years, there is still a dichotomous trend in education with respect to behavioral objectives. There is the school of thought headed by Mager, Popham, and Bloom among others, who would have us detail in minute behavioral terms what we are trying to communicate. On the other hand there is the movement with spokesmen like Atkin, Ausabel, and Rath which questions the efficacy of the former school, suggesting that when forced to communicate all instructional intent in behavioral terms, it is possible that the essence of what we are about may well be lost.

These two positions in fact may not be polar opposites, nor are they mutually exclusive. In reality they seem to stand simply at different points on a single continuum.

Examine for a moment the early beginnings of this controversy: Why is it that objectives ever began? The problem actually had its basis in the need for measurement -- when some attempt was made to assess student achievement.

And this is the point at which evaluators entered the scene.

Evaluators and evaluations have had, and continue to have, a bad name. They are associated with anxiety on both the teachers' and students' parts....."Tell me your specific objectives and then I will evaluate."

But there is a second, more serious shortcoming of evaluators: the subjective approach to evaluation, where the evaluator enters the situation and "feels" what is happening.

Yet a third problem which contributes to the fear and anxiety associated with evaluation is that the evaluator will use outside, unknown or irrelevant criteria to evaluate "my school" or "my course" or me.

These problems with the current state of evaluations need not be the case. In fact the whole nature of evaluation, what it is and isn't, what it should and shouldn't do is changing (Stake 1967, Stufflebeam 1969, Seriven 1967). Evaluation is headed for a new definition -- for which indeed it is time.

It is in this new development of redefinition of the function of evaluation that Hutchinson has devised a procedure entitled "The Operationalization of Fuzzy Concepts."

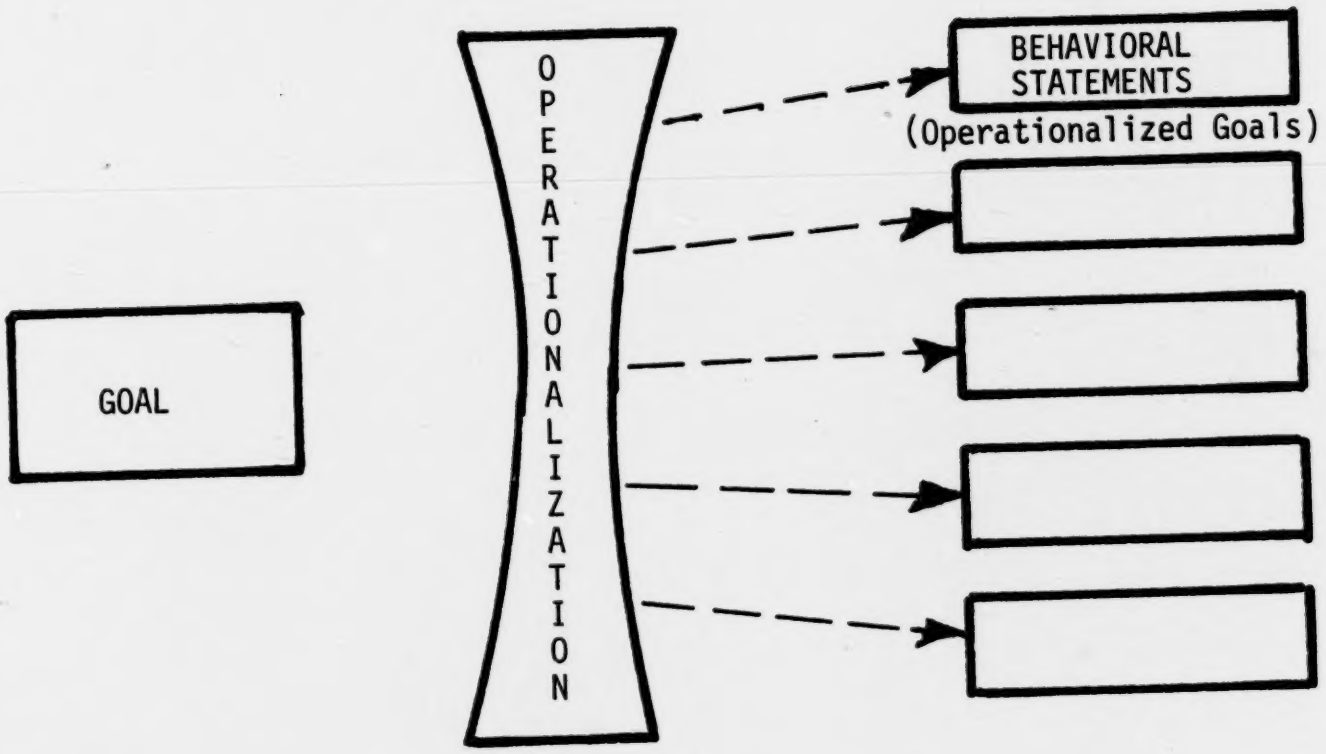
There are numerous applications and potential possibilities to this strategy. One such application is dealing with educational goals that need translation into behavioral objectives.

What is a Fuzzy Concept?

Fuzzy concepts are common. All of us use them every day of our lives in communicating: peace, love, democracy, help, fulfillment are just a few examples of the many, many fuzzies used frequently today. Because each of us has different perceptions of the same words (such as those above) or phrases like self-actualization, student-centered learning, individualized instruction, there often arises misunderstanding, disagreement, tension and even conflict. Often one hears the point made that what is really the issue is a semantic problem, a communication gap. This is due in part to the use of fuzzy concepts.

Fuzzy concepts can also be said to represent the dichotomy between instructional or behavioral objectives and goals or non-instructional objectives. A goal, for example, is an "end" in non-behaviorally defined terms such as "The student shall be self-actualizing." An instructional or behavioral objective, on the other hand, is an operationalized goal: "The student shall list in writing his own reading of at least five books in this course in Learning Psychology."

A goal, when the operationalization technique is applied will probably yield many behavioral objectives. It is important, therefore, not to dismiss goals, just as it is important not to dismiss objectives.



NOTE: THE PROCEDURE YOU WILL EXPERIENCE DURING THIS SELF-INSTRUCTIONAL MODULE IS A NEW METHOD FOR OPERATIONALLY DEFINED GOALS.

IN ORDER TO APPROXIMATE THE EXPERIENCE, THE READER IS ENCOURAGED TO PRACTICE EACH STEP OF THE PROCEDURE AS IT IS INTRODUCED AND DISCUSSED. THE BEST WAY TO LEARN THIS TECHNIQUE IS TO EXPERIENCE IT. THE READER MAY LOSE MANY OF THE BENEFITS OF THIS STRATEGY IF HE IS EXPOSED TO THE MATERIAL WITHOUT ACTUALLY FOLLOWING THE PRODECURE STEP BY STEP.

The Operationalization of Fuzzy Concepts

A METHODOLOGY

When you are ready to begin, think of a goal or intention that you want to work with. It may be easiest for you to use the one which appears as the example in this module: "Helping others." But you may choose your own if you wish; it should be one which has some importance to you and it should be "good and fuzzy" for the purpose of learning the procedure. Write it down: (sometimes when the goal is not written down it changes in the process of operationalization).

GOAL: _____

_____

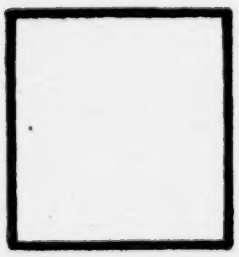
_____

_____

_____

If your goal is not "helping others," then when the term "helping others" appears in the following pages you should substitute mentally the goal which you have written down.

Step 1:



The first step is to construct in your mind a hypothetical situation. This hypothetic situation should be as real and as complete as possible -- with people in it,

furniture, a complete environment. It might be indoors or outdoors.

Now imagine that the goal you listed earlier -- the fuzzy concept -- exists in this situation and is in the epitome; it is 100% present.

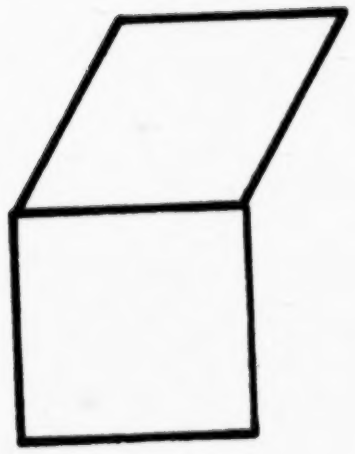
Observe that situation and all that you see occuring that indicates to you that your fuzzy concept is present and at work.

Now list those things you can observe.....people interacting, events occurring.....what is going on that indicates that your goal is being accomplished 100%. Make this list on the next page.

WRITE DOWN THE THINGS YOU SEE THAT INDICATE TO YOU THAT YOUR FUZZY CONCEPT (GOAL) IS AT WORK. BE SURE TO EXHAUST THE HYPOTHETICAL SITUATION. DON'T JUST PUT DOWN THE FIRST TWO OR THREE THINGS THAT COME TO MIND. KEEP GOING.

When you have exhausted this process, proceed to the next page.

Step 2:



The second step then is to construct a new hypothetical situation -- as complete as possible (people, furniture, etc.) in which there is a complete absence of your fuzzy concept.

What do you observe in this situation that indicates to you that your goal is completely absent from this situation? (Don't bother with the negative statements of the positive elements listed in the previous step.)

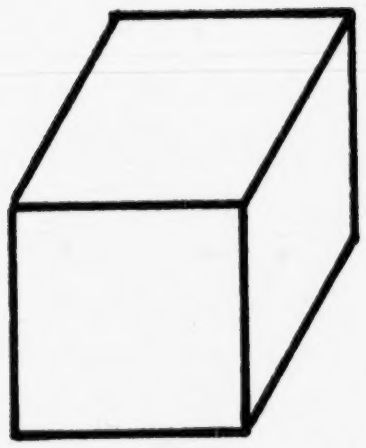
Use this hypothetical situation to identify a wider range of dimensions than you got from the first steps. Make this list on the next page.

WRITE DOWN THE THINGS YOU SEE THAT INDICATE TO YOU THAT THE FUZZY CONCEPT IS ABSENT.

Again try to exhaust the situation.

Now proceed to the next page.

Step 3:



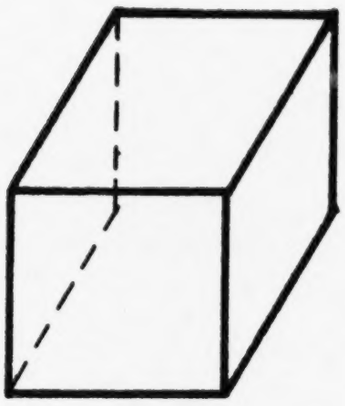
The third step consists of getting someone else to go through the same first two steps with your particular fuzzy concept. These are actually tests of completeness. Use the other person's list then to draw additional items from.

Should you decide the item is unappropriate, reject it -- but it may be possible that someone else's listing on your fuzzy concept might make you think of one or more dimensions that you may have forgotten. List additional items on the next page.

ADDITIONS TO YOUR LIST BASED ON COMPARISON WITH OTHERS.

When you have finished comparing lists, proceed to the next page.

Step 4:

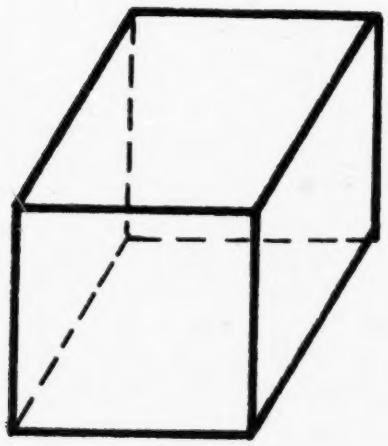


The fourth step is yet another test of completeness. Go back to your original hypothetical situation, re-created in the first step. Take a good hard look at what you see happening. Is there anything you did not think important enough to write down? Examine the implications of what you have omitted -- will it hamper the fullest functioning of your "fuzzy concept?" Use the next page for your list.

RE-EXAMINATION OF ORIGINAL HYPOTHETICAL SITUATION:

Now continue to the next page.

Step 5:



This is relatively harder to perform, so just let your thoughts flow without pausing to ponder too long.

Think up some dimensions that have nothing to do (that are not related) to your fuzzy concept. Use the next page for your list.

LIST RESULTS OBTAINED.

Here is one way the step can work. Let us say, for example, I am a marriage counselor and a fellow comes who is having domestic problems at home. I have him operationalize what he means by "good father," and he goes through a positive hypothetical situation and a negative hypothetical situation and then sees some other people's lists. (Because I've been doing this for 20 years, I have a lot of them handy.) Then he goes back to the hypothetical situations and looks again at what is going on and examines whether or not the things that are going on really have anything to do with "good father". So for about an hour or more he has been immersed in this fuzzy concept. Then I ask "All right, what has nothing to do with it?" and he replies, "How much time I spend at home." People <u>don't</u> think up things that have nothing to do with their concept when you ask them to. Of course, if you cognated over it long enough, you would think of the pyramids of Egypt or the dark side of the moon. But if you just let it happen, what would you get? You would get things that really <u>are</u> related, as a result of the mind-freeing twist of the question, "What has nothing to do with it?" It may be something, in the case of counseling, that is a repressed dimension. It may be, in other cases, things that might be considered frivolous. The frivolous things come up, and you can examine them seriously. You see, one of the things that we mean in Western thought by "ridiculous" is "don't think about it", and my suggestion is that's dangerous. We have to think about such things. The greater our tendency is to label something ridiculous, probably the more important it is to consider it very seriously, because it is within that area that we are not utilizing our thought, not giving it careful consideration.

By this last step, you may have identified some more dimensions and all I will ever claim is that at the very best, doing the whole procedure carefully and exhausting each step, you will get a very good approximation

to the number of dimensions that you have, what you mean when you use the term "helping others".

Now the next thing to do is to go back to the first item on the first line and look at it -- the very first item on the first list. And ask yourself the following question,"Is this either a directly observable behavior or a directly observable state?"

Usually at the very first level of breakdown for a very fuzzy concept there will be very few dimensions that are directly observable behaviors or states. However, as you go down the structure, you will gradually get a higher and higher percentage of directly observable behaviors or states until, if you operationalize all of it, you will have a very long, very comprehensive, very complete approximation to the total number of specific behavioral events and states that you mean when you use this term.

Conclusion

The primary purpose for which this technique ("The Operationalizing of Fuzzy Concepts") was developed was to provide a way of systematically breaking down a generalization (a fuzzy concept, goal, intent, purpose, etc.) into its measurable parts.

Thus it is a basic analytical process - employing both an objective structure (in terms of the criteria of measurability) and a subjective structure (in terms of creativity,for example,in the hypothetical situation).

The Operationalizing of Fuzzy Concepts is a contrast-probing technique which serves to bring behavioral elements into a context. The user may find it helpful in describing the intent of his instructional program in measurable, observable components.

TRANSPARENCIES

The following pages contain samples of transparencies produced by ESCOE, which may be used by LEAs for training purposes:

(1) as an introduction to the Evaluation Service Center

(2) as an introduction to Behavioral Objectives

This is by no means a complete set. ESCOE is in the process of developing other visuals, which it is hoped will prove helpful to Facilitators and Instructors, associated with the project.

"If we don't know where we are going how will we know when we have arrived?"

An Introduction to the Evaluation Service Center for Occupational Education

E S C O E

85 North Whitney Street Amherst, Mass. 01002

1968—P.L. 90-756, AMENDMENT TO THE VOCATIONAL EDUCATION ACT OF 1963 DIRECTS STATE ADVISORY COUNCILS ON VOCATIONAL EDUCATION TO EVALUATE PROGRAMS ASSISTED UNDER THIS TITLE.

PHILOSOPHY OF ESCOE

IT IS BETTER FOR ALL CONCERNED IF A L.E.A. (LOCAL EDUCATIONAL AGENCY) DETERMINES ITS OWN OBJECTIVES, THEN TEACHES AND TESTS TO THESE, IN LIEU OF STATE MANDATED OBJECTIVES WITH STANDARDIZED CURRICULUM AND TESTING.

1. TO DEVELOPE A BANK OF BEHAVIORALLY STATED OBJECTIVES IN SELECTED AREAS OF STUDY.
2. TO CREATE A FEEDBACK LOOP BETWEEN L.E.A.s AND ESCOE.
3. TO DEVELOPE TEST INSTRUMENTS IN THESE SELECTED AREAS FOR USE BY THE L.E.A.s.
4. TO CREATE AN ONGOING SERVICE CENTER FOR USE BY PARTICIPATING L.E.A.s.

1. TO TRAIN FACILITATORS FROM L.E.A.s TO WRITE AND EDIT BEHAVIORALLY STATED OBJECTIVES.

2. TO CONDUCT WORKSHOPS IN THE L.E.A.s TO ASSIST FACILITATORS IN TRAINING THEIR FACULTIES.

3. TO ASSIST IN THE DEVELOPEMENT OF OBJECTIVES IN SELECTED AREAS OF STUDY THROUGH LOCAL FACILITATORS.

4. TO CODIFY & PLACE THESE OBJECTIVES IN A COMPUTER DATA BANK.

5. TO EMPLOY CONSULTANTS IN VARIOUS SUBJECT AREAS TO SYNTHESIZE.

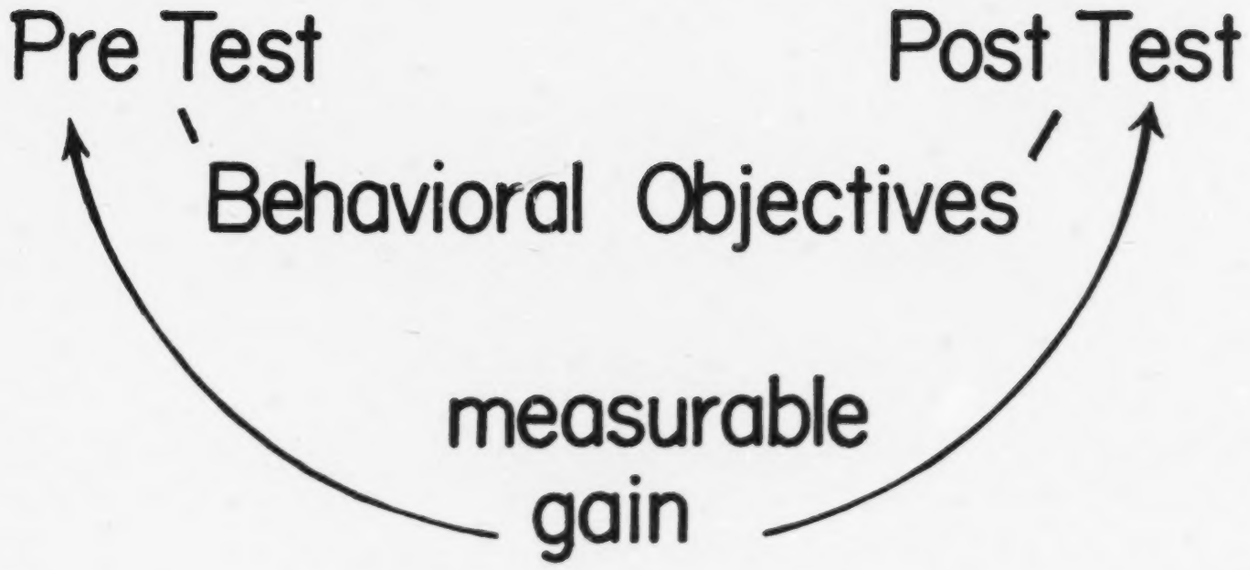
6. TO DEVELOPE THE FEEDBACK LOOP BY VARIOUS DEVICES SUCH AS SIMPLIFIED FORMS & CHECKOFF SYSTEMS.

7. TO BRING TO THE CENTER SUBJECT AREA SPECIALIST TO WORK WITH TESTING SPECIALIST IN DEVELOPING TESTING INSTRUMENTS.

8. TO TRAIN FACILITATORS FOR TEST ADMINISTRATION.

9. TO ASSIST IN TEST ADMINISTRATION AT THE L.E.A.s.

EVENTUAL PROGRAM



THE SYSTEMS APPROACH

1. Define objectives
2. Choose appropriate methods
3. Select appropriate learning experiences
4. Select appropriate materials
5. Define and assign appropriate personnel roles
6. Implement the program
7. Test and evaluate the outcome
8. Refine and revise as necessary

From The Conditions of Learning

by Robert Gagne

SOME POSSIBLE ADVANTAGES

1. EXAMINATION OF PRESENT COURSE OBJECTIVES FOR RELEVANCY.
2. MEETING THE NEEDS OF THE STUDENT BY CLARIFYING COURSE GOALS.
3. CLARIFYING TEACHING METHODS & PROCEDURES NEEDED TO MEET THE COURSE OBJECTIVES.
4. ELIMINATION OF IDENTICAL OBJECTIVES IN TWO OR MORE COURSES WITHIN A CURRICULUM.
5. SIMPLIFYING CONSTRUCTION OF QUIZZES, TESTS AND FINAL EXAMINATIONS.
6. FEED BACK OF RELATED COURSE OBJECTIVES FROM OTHER COMMUNITY COLLEGES.
7. FEED BACK OF TESTING INSTRUMENTS BASED UPON YOUR OWN STATED OBJECTIVES IN COURSE EVALUATION.

ADVANTAGES (continued)

8. FEEDBACK OF COURSE OBJECTIVES FOR DEVELOPING NEW COURSES FOR DETERMINING PREREQUISITES OR RECONSTRUCTING A PRESENT ONE.

9. ACCOUNTABILITY & LOCAL AUTONOMY: USING THE EVALUATION SERVICE CENTER WILL ALLOW YOU TO CHOOSE OR DEVELOP YOUR OWN LOCAL OBJECTIVES IN A FRAMEWORK OF A COMPUTERIZED FEEDBACK SYSTEM. THIS WILL GIVE COST REDUCTION THROUGH ACTING IN CONCERT WITH OTHER COMMUNITY COLLEGES.

10. EVALUATION OF PROGRAMS WITHOUT STANDARDIZED RESULTS SINCE YOU ARE EVALUATED ONLY ON OBJECTIVES CHOSEN BY YOU & YOUR STAFF.

11. SIMPLIFIES EVALUATION OF A STUDENT'S PAST COURSE WORK FOR POSSIBLE GRANTING OF CREDITS.

12. PRODUCTION OF MEDIA IS SIMPLIFIED WHEN OBJECTIVES ARE STATED CLEARLY.

THROUGH THE WRITING OF BEHAVIORALLY STATED OBJECTIVES THE GOALS ARE CLARIFIED FOR THE ADMINISTRATOR, THE STUDENT AND THE TEACHER, WITH NO ONE TIED IN A STRAIT JACKET THAT HAS BEEN MANDATED BY SOMEONE REMOTE FROM THE SCENE, YET EVALUATION OF THE PROGRAM IS STILL QUITE READILY ACCOMPLISHED.

BEHAVIORAL OBJECTIVE

CONDITION

WHAT MATERIAL AND WHAT PROCEDURES CONSTITUTE AN INTEGRAL PART OF THE STUDENT PERFORMANCE ?

PERFORMANCE

EXACTLY WHAT WILL THE SUCCESSFUL STUDENT BE EXPECTED TO DO ?

EXTENT

HOW WILL ONE KNOW WHEN THE STUDENT IS PERFORMING THIS SUCCESSFULLY ?

BEHAVIOR OBJECTIVES

Another way of stating it

MEASURABLE OR OBSERVABLE BEHAVIOR

What is it that I want the student to do and how will I know when he or she is doing it ?

Could another person knowledgable in my field test my students for just what I want them to know or do ?

WORDS OPEN TO MANY INTERPRETATIONS

To know

To understand

To really understand

To appreciate

To fully appreciate

To grasp the significance of

To enjoy

To believe

To have faith in

WORDS OPEN TO FEWER INTERPRETATIONS

To write

To recite

To identify

To differentiate

To solve

To construct

To list

To compare

To contrast

CONDITIONS

AFTER ONE WEEKS PREPARATION TIME, WITH THE USE OF NOTES, AND BEFORE A LIVE AUDIENCE.

PERFORMANCE

THE STUDENT WILL DELIVER A SPEECH DESIGNED TO PERSUADE THOSE PRESENT TO CHANGE THEIR MINDS.

EXTENT

THE MAJOR PERSUASIVE TECHNIQUES TAUGHT IN THE COURSE MUST BE APPLIED DURING DELIVERY, AT LEAST 80% OF THE TIME.

CONDITION

WITHOUT THE AID OF REFERENCES

PERFORMANCE

THE STUDENT WILL DRAW AN ORGANIZ-
ATIONAL DIAGRAM OF CONGRESS SHOW-
ING THE UNITS AND RELATIONSHIPS
BETWEEN UNITS.

EXTENT

CLEARLY SHOWN AND 90% ACCURATE.

CONDITION

WITHOUT THE AID OF REFERENCES

PERFORMANCE

THE STUDENT WILL WRITE A SHORT ESSAY DEMONSTRATING PROPER USE OF THE 8 MAJOR PUNCTUATION MARKS.

EXTENT

WITH 7 OUT OF 8 CORRECT.

CONCLUSION

In conclusion, it might be interesting to consider a possible behavioral objective for the users of this training package. Using the ESCOE format, such an objective would read:

CONDITIONS: Given an objective writing workshop, a copy of this publication, and technical expertise in a particular subgroup

PERFORMANCE: The user will identify the performance criteria for his course by writing behavioral objectives at the unit level

EXTENT: So that the CONDITIONS states the exact circumstances under which the objective is performed; the PERFORMANCE states the exact observable behavior that is required; and the EXTENT states the exact criteria used to measure the performance.

GLOSSARY OF TERMS AND PHRASES

AFFECTIVE CAPABILITIES

Positive or negative feelings toward an object, person, or idea.

AFFECTIVE DOMAIN

The sphere of learning that deals with feelings or attitudes.

BATCH

A set of four subgroups processed simultaneously.

BEHAVIORAL OBJECTIVE

A measure from which capabilities can be inferred, listing the exact performance to be demonstrated, the exact conditions under which the performance is carried out, and the exact extent (degree of completeness, accuracy, speed, etc.) to which the performance will be measured.

BLOCK

Largest instructional segment of a subgroup.

CAPABILITY CLASSIFICATION

A system for coding the abilities demonstrated by the performance of a behavioral objective as psychomotor, cognitive, affective, or combinations thereof.

CATEGORY BREAKDOWN

The terms Field of Study, Major Group, Subgroup--which ESCOE uses to categorize occupational programs of study.

CODING HEADER

A tabular listing of data.

COGNITIVE CAPABILITIES

The ability to do things that are mostly intellectual or mental in nature. In general, cognitive capabilities involve acquiring and applying knowledge or information.

COGNITIVE DOMAIN

The sphere of learning which deals with developing intellectual or mental capabilities.

CONDITIONS

That portion of a behavioral objective which states the exact circumstances under which the objective is performed, including: instructions, raw materials, parts, tools, equipment, drawings, models, etc.

CRITERION

A standard of judgment.

CRITERION-REFERENCED STANDARDS

Scores are interpreted as to the amount of proficiency the individual exhibits in a subject area. The score would describe how the student performed on specific objectives at a given point in his learning program.

CRITERION TEST

The evaluation instrument used to assess the degree to which the performance of the student meets pre-determined performance objectives.

DOMAINS

Educational spheres of learning, i.e., Affective, Cognitive, Psychomotor.

ESCOE

Evaluation Service Center for Occupational Education.

EXTENT

That portion of a behavioral objective which states the exact criteria used to measure the performance, including: tolerances, accuracy, quality or workmanship, speed, etc.

FACILITATOR

ESCOE liaison person in a local educational agency.

FEEDBACK

The process of communicating the products of the system to the users and the process by which the users react to the performance of the system.

FEEDBACK CHECKLIST

Form used by ESCOE to communicate responses/comments relative to objectives submitted by LEAs.

FIELD OF STUDY

The broadest category of occupational area classification, i.e., Trade and Industry, Health Occupations, etc.

FIXED TEXT

The portion of a synthesized objective that is not optionable.

FORM CHANGES

The options available within a synthesized objective. (The so-called variable text.)

INPUT

Material upon which the system operates and is developed.

LEA

see Local Educational Agency

LEARNING DOMAINS

Spheres of educational influence, i.e., Affective, Cognitive, Psychomotor.

LOCAL EDUCATIONAL AGENCY

A school, i.e., high school, trade school, vocational-technical school, BOCES center, community college, junior college, skills center, etc.

MAJOR GROUP

Category breakdown of occupational programs within a Field of Study, i.e., Health occupations: Dental Services, Medical Services, Nursing.

MATRIX

A rectangular array of information displayed on a chart having horizontal and vertical coordinates.

NORM-REFERENCED STANDARDS

Traditional approach where students' performance is compared to the performance of others in the same reference group, such as achievement tests and aptitude tests. These tests provide no direct indication of the individual's degree of proficiency in the subject matter.

OUTPUT

The product of the system.

PERFORMANCE

That portion of a behavioral objective that states the exact observable behavior that is required.

PRINTOUT

Printed computer output.

PROCESS

The ongoing state of the system while doing whatever has to be done in order to attain the purpose.

PSYCHOMOTOR CAPABILITIES

The ability to do things that are mostly muscular in nature, but which ensue from cognitive capabilities. In general, psychomotor capabilities involve manipulating objects with various parts of the body.

PSYCHOMOTOR DOMAIN

The sphere of learning that deals with developing physical skills requiring muscular coordination and varying degrees of strength.

RAWOB

see Raw Objective

RAW OBJECTIVE

Behavioral Objective written by the Local Education Agency.

SUBGROUP

Category breakdown of occupation programs within a Major Group, i.e., Dental Services: Dental Assistant, Dental Laboratory Technician, Dental (other).

SYNOB

see Synthesized Objective.

SYNTHESIZE (dictionary)

(1) To make up by combining parts or elements.
(2) To combine into a complex whole.

SYNTHESIZED OBJECTIVE

A behavioral objective consisting of fixed and variable text, produced by combining raw objectives having the same or similar performances into one objective so that all variations of conditions and extent indicated by the LEAs are included.

SYSTEM

Entity designed by man which applies commonsense decision-making by using self-correcting and logical methodology. Includes identification of specific goals and objectives, the analysis of functions and components, the training and testing of the system, the installation and quality control.

TERMINAL OBJECTIVE

A desired outcome of an educational program.

Infers a capability which is an essential, specific occupational competency.

A capability that cannot be inferred from a higher order objective.

TEST DEVELOPMENT

The research process of creating, from standard instructional activities, measures of performance stated by each synthesized objective. The process includes placing these observed activities in a format so as to standardize their administration and scoring, and so that they may be requested and organized into a test packet tailored to test the objectives taught in a given classroom.

UNIT

Instructional segments within a Block.

U.S.O.E.

United States Office of Education.

U.S.O.E. Code

United States Office of Education code numbers used to identify trades, academic subjects. occupational areas, etc.

Variable Text

That portion of a synthesized objective which is optionable. (The Form Changes.)

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